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ABSTRACT

Sex differences on Perry's stages of epistemological development were investigated in a study of 100 freshmen (50 men and 50 women) at a large midwestern university. A semi-structured interview probed six domains related to Perry's theory, including the role of the learner, instructor, and peers in the learning situation, the question of evaluation of learning, the nature of knowledge, and educational decision making. Students also completed the Measure of Epistemological Reflection (MER), based on Perry's first five levels, and the Learning Style Inventory (Kolb). No significant differences emerged in either MER or interview means by sex. But there was evidence of gender-related (though not gender-specific) patterns in the use of certain reasoning structures. At Position Two, where knowledge is seen as certain, females expressed hesitancy to speak in class or criticize authority. They emphasized peer-support connections in receiving knowledge. Males described an active, critical search for answers and engaged peers in argument and quizzing. At Position Three, where awareness of some uncertainty begins, females tend to adopt a subjective knowledge stance, whereas males prefer working through uncertainty with logic and debate. Data from the Learning Style Inventory was inconclusive. Educational implications are considered. (LPG)

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Gender Differences In Cognitive Development

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Gender Differences in Cognitive Development

Abstract

Recent research on female intellectual development has raised questions regarding gender differences in this area. Results of the simultaneous study of male and female college freshmen described here support the hypothesis that both genders share a cognitive developmental structural framework that underlies distinct gender related patterns of intellectual development. Those patterns, as well as gender differences in learning styles, are described along with their implications for creating effective learning environments for college students.

Gender Differences in Cognitive Development

Research in the last decade has identified a critical weakness in existing human development theory--superimposing the development of women on descriptions of male development. A few theorists have argued persuasively that women's development represents a separate model and schemes are beginning to emerge from the study of women. These parallel but unique schemes pose new questions regarding the nature of gender differences in development.

Traditionally human development has been described on the basis of the study of males. Freud's (1905/1961) account of psychosexual development, Erikson's (1968) account of psychosocial development and Piaget's (1965) description of cognitive development all relied on the male experience for their evolution. Moreover, when gender differences did appear they were interpreted as a failure on the part of women to develop. Freud (1925/1961) suggested that young girls' inability to resolve the Oedipal complex left their egos more dependent on emotional origins. Erikson (1968) suggested that female identity was contingent on establishment of intimacy, a contingency not relevant to males. Chickering (1969) described the psychosocial issues that are prevalent in Erikson's identity stage by observing males at Goddard College. The resulting vectors indicated that identity formation formed the basis for the development of intimacy. However, as was the case with Erikson's stages, evidence appeared (Gilligan, 1979) that some women engaged in developing intimacy prior to developing identity. Piaget (1932/1965) suggested that girls' sense of justice was less developed than that of boys. Kohlberg (1969) elaborated on Piaget's earlier description of moral development by observing men, presenting a six stage universal model. Comparison of women to the universal process revealed that

they had a tendency to become fixated at stage three in which moral judgments are based on the perceived approval of significant others (Kohlberg and Kramer, 1969). Gilligan's (1982) review of this literature points out that women's relationship to others appears to be the source of these developmental 'deviations'.

A few theorists have challenged the perspective that women's development is problematic, arguing that the problem is instead in the realm of research methodology and theory development. The common element of their work is the socialization of women and its effect on the formation of gender identity. Chodorow (1978) explains that the early socialization of girls has as a central element the attachment to the mother. In contrast boys' identity formation is characterized by individuation from the mother. Gilligan (1982) details the ongoing path of attachment in female socialization to articulate the 'different voice' of women in the area of moral development. Both theorists frame the female perspective as legitimate in its own right rather than inferior to a male standard. The essential message in their work is the important role experience plays in development. The interpersonal dynamics surrounding a psychosocial developmental crisis and the nature of cognitive dissonance experienced are both effected by socialization. When male experience is used to refine the specifics of development the result is a description contingent upon male socialization. Generalization of such a description to women fails to acknowledge the different nature of female socialization and thus of female development.

Research in intellectual development provides additional evidence that the fundamental process described by Piaget is consistent for both sexes but evolves in different gender related patterns. Perry's (1970) elaboration of Piaget's notion of intellectual development provided a nine position sequence of college students epistemological thought on the basis of a predominantly

male sample. Studies of women (Clinchy & Zimmerman, 1982; Belenky, Clinchy, Goldberger, & Tarule, 1986) indicate that women's experience prompts a different pattern of the sequence exhibited by Perry's men. It also appears, as it did in Gilligan's work, that different patterns are gender related but are not gender specific. The purpose of this study is compare male and female epistemological thought in order to articulate gender differences in intellectual development.

Intellectual Development Research

Piaget (1950) established the fundamental nature of cognitive development in describing the process of equilibration. Piaget suggested that thought is characterized by a cognitive structure or a way of viewing the world that remains consistent across content areas. Further he indicated that individuals react to incongruity between experience and cognitive structure in an attempt to keep the two in balance. This reaction or equilibration process consists of two components. When experiences are incongruent with one's way of viewing the world it is generally the discrepant experience that is assimilated into the cognitive structure. When the degree of dissonance no longer facilitates assimilation the cognitive structure is changed to accommodate the experience. Either reaction restores congruency between experience and perceived reality but only accommodation results in cognitive growth.

Perry (1970) extended Piaget's explanation of cognitive development to the college years, outlining a nine position scheme of intellectual development. The first five positions describe epistemological changes while the last four address the development of commitment in a contextual world. The first two positions represent a dualistic way of viewing the world. In Position One the person perceives all knowledge as known and is unaware of uncertainty. Uncertainty of knowledge appears as a temporary phenomena in

Position Two when authority figures conceal the truth temporarily to promote exercises that are good for students. Since the authority figures know the truth the uncertainty is perceived as unreal. Position Three introduces the next epistemological change in acknowledging that all knowledge is not known at the present time. Those areas in which truth is unknown represent uncertainty that will someday be resolved when the truth is discovered. Focus in this position is on looking for the right process by which to discover the truth. Position Four brings the realization that most, if not all, knowledge is uncertain. The search for the truth is abandoned in favor of finding a way to think about the multitude of possibilities available from which to choose what to believe. Since no criteria exist on which to base decisions of truth, everyone is entitled to his/her own opinion. Position Five, called relativism or contextual thinking, restores the ability to choose through the recognition that some choices are better than others based on the context surrounding the choice. The relativistic thinker assesses evidence in a context to support and defend a stance. Knowledge thus becomes able to be known again but in a different way than it was known in the dualistic phase of the scheme.

Perry's scheme, like most research conducted at that time, was based on a predominantly male sample. Research on gender differences in moral development (Gilligan, 1977, 1982; Lyons, 1983) prompted questions of gender differences in intellectual development. Gilligan's suggestion that women's moral development focused more on connection to others through care while men focused more on separation from others through rights emerged in Lyons' descriptions of construction of the self. Females were more apt to describe self in connected terms while males were more apt to use separate oriented terms. Lyons' data further suggested that these differences carried over into conceptualizations of self in relation to others. Alishio and Schilling

(1984) attempted to ascertain whether the epistemological assumptions underlying these conceptualizations of self and relationships were different by studying the structure and content of Perry's scheme. No structural differences emerged, but the results pointed to parallel progressions in the construction of relationships with men focusing on interpersonal rightness and women focusing on the issue of trust. These parallel progressions remained in a more extensive study (Alishio, 1985) which also provided evidence that these differences are linked to gender but both genders use both conceptualizations in the course of development. This research collectively suggested possible differences in underlying epistemological assumptions.

Gender differences also emerged in areas related more directly to intellectual development. The literature on learning styles (Kolb, 1984) identified preferences individuals exhibit toward grasping and transforming information. Kolb explained that some prefer to grasp information through concrete experience (use of feelings) while others rely on reflective observation (watching). In a similar distinction some transform information through active experimentation (doing) while others do so through abstract conceptualization (thinking). A persons' combination of preferences on these two dimensions results in four distinct learning styles. A study of women at Alverno College suggested a potential relationship between learning style and Perry intellectual development. Mentkowski and Strait (1983) reported that entering students who were in the early positions of the Perry scheme preferred reflective observation and concrete experience modes. Graduating students, rated as more complex on the Perry scheme, preferred abstract conceptualization and active experimentation. This suggested that certain learning styles might be related to intellectual complexity. Longitudinal results reported by Mentkowski (1984) indicated that entering students' preference for concrete experience and reflective observation disappeared

by the middle of their college experience. Two years after entrance the students' preferences on each dimension were nearly equal.

Kolb's data (McBer & Co., 1986) revealed that gender differences existed on the abstract-concrete dimension. Men were more often oriented toward the abstract while women were more often oriented toward the concrete. Kolb speculated that this difference emerges from socialization, a premise also held by Prosser-Gelwick (1985). Given the potential relationship of learning styles and intellectual development, gender differences in learning preference could imply gender differences in intellectual development.

Clinchy and Zimmerman (1982) were the first to directly study women's epistemological assumptions. On the basis of longitudinal interview data they described the relationship of epistemological thought to agency, or the ability to decide and act. In doing so Clinchy and Zimmerman recounted Perry's positions one through five from the perspective of women students at Wellesley College. Positions One and Two appear similar to Perry's account. Position Three is basically the same with the exception that Clinchy and Zimmerman's data focus more extensively on the uncertainty aspect of Position Three. Perry's account suggests that truth is still known in some areas and in those that are unknown comfort exists in the belief that truth will be forthcoming in the future. The data Clinchy and Zimmerman present emphasizes the women's preoccupation with the inability to know in an absolute sense. Moreover they suggest that the women believe everyone has a right to his/her own opinion while no one has the right to judge others' opinions. This notion is part of Position Four in Perry's original scheme. The progression Clinchy and Zimmerman's data depicts in Position Four from figuring out what the teacher wants to deciding the teacher wants contextual thinking parallels Perry's descriptions of learning how to think in Position Four. Both schemes present the same notion of Position Five but Clinchy and Zimmerman substitute

contextualism to reduce the confusion often generated by the word relativism. Both depict the acknowledgment of the ability to choose in an uncertain world on the basis of criteria relevant to the context in question.

Clinchy and Zimmerman's (1982) data supported the notion of parallel progressions but implied that potential differences existed in the transition from certainty to uncertainty that accompanies the changes in Position Three and the transition to Four. Similar evidence appeared in the most comprehensive study of female intellectual development to date (Belenky, Clinchy, Goldberger, & Tarule, 1986). Belenky and her colleagues interviewed 90 college women and 45 non-college women to derive a description of five epistemological perspectives. Belenky et. al. stress that these perspectives are not offered as a sequential hierarchical process but rather qualitatively different ways of knowing. The initial perspective of silence is similar to Perry's Position One in its view of authorities as all powerful. Belenky et. al. use the word silence to reflect the absence of a voice, indicating that women feel they have no voice of their own, cannot learn from their own experience, and cannot learn from others' words. This perspective was not seen in the college sample, and rarely seen in the non-college sample but rather emerged from retrospective views of the women interviewed. In the next perspective, received knowledge, ability to learn from listening to others emerges. Authorities remain the source of knowledge but one can gain knowledge from listening to them and no longer must be shown to understand. Learning is perceived as obtaining and keeping information authorities have and little confidence exists in one's own ability to speak. In comparing this perspective to Perry's Position Two, Belenky et. al. distinguish males as identifying with authority, leading to a willingness to speak the truth authorities provide. Females appear not to identify with authority and thus listen to and accept authority but are less active than males in learning

experiences. Beyond this distinction, the basic perspective appears to be similar to Perry's dualism.

Gender differences begin to appear in the next perspective of subjective knowledge. Subjective knowers still believe right answers exist but they are obtained from firsthand experience and one's inner voice rather than from authorities. Truth becomes personal and intuitive. Everyone has his/her own personal truth but should not impose it on others. Belenky and colleagues suggest that many women in this position function as "hidden multiplists" since they do not express their opinions. Whereas males assert their right to their own opinion and present it, females keep opinions hidden to avoid alienating themselves from others. When opinions are expressed it is with qualification of the limits of the opinion to personal experience. Additionally the Belenky study describes a resentment or distrust of authorities who previously controlled thinking which prompts an escape or retreat from authorities in favor of gathering one's own experience. This reaction may account for what appears to be a lack of the Position Three view on the part of the women interviewed. The subjective knowledge perspective is more like Perry's Position Four, all knowledge is uncertain, than it is like Three where some knowledge is certain and some is yet to be known. Perhaps the female need to free self from authority results in movement to uncertainty of knowledge without the transition Perry described via Position Three. There is one hint of Position Three thinking in subjective knowing however. The female tendency of listening to herself to hear what is right may represent the type of process Perry's Position Three students used to find the truth in unknown arenas.

The fourth epistemological perspective discussed in the Belenky et. al. study focuses on the methods of knowing rather than the content. Procedural knowing negates the intuitive knowing of the previous perspective in favor of

thinking through or analyzing information. This preoccupation with how to obtain and communicate knowledge stems in part from the notion that everyone views the world through his/her own lens and understanding others perspectives requires figuring out how they view the world. Two forms of procedural knowing are described. Separate knowing relies on an impersonal, objective, critical analysis of ideas to determine their strengths and weaknesses. While this initially sounds like Perry's Position Five thinkers, the women described express it as an academic exercise that is not valued beyond its function in playing the academic game. Connected knowing relies on empathy and understanding as ways of gaining access to others views via sharing their experiences. It is distinguished from separate knowing in its lack of attempt to judge others views in favor of attempts to understand and its inclusion of personal feelings. Both separate and connected knowing have characteristics similar to Perry's Position Four. Commonalities include the basic perspective that all knowledge is uncertain, the utility of hearing others views, and the need to develop a way to think about complex issues. Despite the authors use of the term "reason" in conjunction with this perspective, their description of the perspective does not connote reason in the sense of evidence for one's views that appears in the next perspective.

Constructed knowledge is the fifth and most complex perspective described in the Belenky et. al. study. As its label implies, it entails the belief that all knowledge is constructed and exists in a context. The ability to listen to the inner voice as well as others' voices allows for integration of knowledge to draw conclusions in a context. Women no longer fear this dialogue as it can be a form of connection as persons work together to construct knowledge. This perspective reflects the same explanation of knowledge found in Perry's fifth position.

Viewed collectively the intellectual development research appears to reveal the parallel progression of distinct gender patterns found in other

areas of development. However, in light of the essential role of experience in cognitive development, comparison of male development in the 1950's and female development in the 1980's makes interpreting gender differences extremely difficult. Evidence of both men and women characterized by the developmental pattern opposite their gender (Gilligan, 1982; Lyons, 1983, Alishio, 1985) demonstrates the need to study both genders simultaneously to clarify gender patterns and the extent of their use by each gender. Simultaneous study of both genders in the current study was expected to reveal no differences in the structural foundations of development. The parallel progression of qualitatively different gender related patterns was expected to emerge, but the patterns were not expected to be used exclusively by one gender. The dimension of learning style was included as a relevant variable even though current literature did not warrant a specific hypothesis regarding its relationship to intellectual development.

Methods

Participants

Participants included 100 freshmen, 50 of each gender, randomly selected from the population of freshmen at a large midwestern state university. Freshmen just entering college were chosen to acquire their perspectives prior to the college experience and to facilitate further longitudinal research during their college years. The student population from which this group was selected had a mean ACT score of 25.8, an average of 1100 on the SAT, and a 3.4 cumulative high school grade point average. They ranged in age from 17 to 22, with a mean of 18.

Procedures

Six areas directly related to epistemological assumptions have been defined by collective research related to the Perry scheme. Those include the role of the learner, instructor, and peers in the learning situation, the

question of evaluation of learning, the nature of knowledge, and educational decision making. Assessing students' thinking in these six domains occurred in two ways. First the students participated in a semi-structured interview soliciting their perspective on each of these areas. The interview was structured to the extent that it guided the respondents to talk about these areas, but was open ended with minimal direction from the interviewer to obtain students' own views. The interview questions directly addressed the first five areas. The nature of knowledge was explored through asking respondents to describe the most significant aspect of their learning in the past year, the value of learning experiences during that time, and changes they would make in those experiences. This interview's validity was supported by significant differences in interview ratings by class rank in a previous study of intellectual development (Baxter Magolda, in press). All interviews occurred between the fourth and eighth weeks of the fall semester.

The same six epistemological domains were also measured by the Measure of Epistemological Reflection (MER), a written instrument designed to assess intellectual development in Perry's first five positions (Taylor, 1983). This instrument asks the respondent to make a choice on each of the six areas and justify his/her thinking related to that choice. These justifications, or reasoning structures, are matched with a rating manual which contains empirically validated reasoning structures for each of the first five Perry positions (Taylor, 1983). Reliability of the instrument has been established through interrater agreement and reliability in numerous studies. Interrater reliability on a sample of 752 was .80 (Baxter Magolda & Porterfield, 1985) and interrater agreement has generally been in the 70 to 80 percent range with chi-squares significant at $p. < .001$ (Baxter Magolda & Porterfield, in press). The MER has consistently revealed significant differences ($p. < .0001$) by level of education and validation with interviews yielded a .93

correlation (Baxter Magolda, in press). Participants completed the MER two weeks after the interview.

Learning styles were assessed with the Learning Styles Inventory (Kolb, 1985). The 1985 Revised Edition of the LSI consists of 12 sentence completion items to which the respondent ranks four endings offered. These rankings reflect the degree to which the respondent displays each of the four learning orientations as well as the learning style resulting from the combination of the four orientations. The publisher of the LSI (McBer and Company, 1985) reported high internal consistency, with Cronbach's alpha coefficients ranging from .73 to .88 for the scales (N=268). Split-half reliability with the original LSI on the same sample ranged from .75 to .81 ($p < .001$). In comparing LSI scores to career field of study the publishers indicated that fields of study related to LSI styles as expected on the basis of the theory. Participants completed the LSI concurrently with the MER.

Responses to the MER were scored independently by certified raters using the MER rating manual. The manual contains descriptions for Positions One through Five, reasoning structures used in each position, and examples of student responses for each reasoning structure. The manual contains six sections, one for each domain. Rating is done by reading an entire domain response, identifying the modal reasoning structure (justification) in the response, matching that reasoning structure to those provided in the manual for that domain, and assigning the Perry position in which the reasoning structure is found. An overall score is derived from the average of the six domain ratings. The MER rating process also allows for the identification of new reasoning structures emerging from data. If the reasoning structure identified in a response is not found in the manual, it is noted as a new reasoning structure and placed in the appropriate Perry position by comparison to position descriptions in the manual. New structures

consistently identified are eventually added to the manual in the empirical verification process. This feature allowed use of the MER rating manual to score the interview data without the risk of forcing new data into an existing format while taking advantage of an established scoring process. Overall scores for the interviews were again obtained by averaging the six domain scores. Learning styles were determined by scoring guides that accompany the instrument.

Results and Discussion

Use of the MER and interview to assess intellectual development on the Perry scheme was intended to insure that the standardized format of the MER did not conceal potential gender differences. Quantitative analysis revealed that both measures assessed development similarly. The correlation between the two measures was .47 ($p. < .0001$), a reasonable correlation in light of all overall scores being in the Position Two and Three range. Group means were similar, with 2.50 for the MER and 2.34 for the interview. Qualitative analysis also revealed strikingly similar results, with the MER data showing finer distinctions in the few instances where difference between the two assessment methods appeared. Subsequently the MER data serves as the basis for discussion of results unless otherwise noted.

Structural Foundations of Intellectual Development

Analysis of variance of both MER and interview means by gender revealed no significant differences. The MER means for females and males were 2.49 (SD=.29) and 2.51 (SD=.33) respectively. The interview means for females and males were 2.32 (SD=.31) and 2.36 (SD=.33) respectively. Although the interview scores were slightly lower for both, no gender differences appear in either measure. This data supports the hypothesis that structural foundations in the initial stages of intellectual development are similar for both genders. Because all students in this sample were rated at Positions

Two and Three for overall scores, it is unclear whether structural differences exist in later positions of intellectual development.

Gender Related Patterns of Reasoning Within Positions

Qualitative analysis of reasoning structure usage by gender was based on the reasoning structure component of the MER rating process. Each domain score for both the MER and interview responses was accompanied by the number of the reasoning structure on which the score was based. Reasoning structures are not sequential or hierarchical but simply qualitatively different modes of justification. Additionally the number of reasoning structures for a particular position in a particular domain varies from four to seven. For these reasons quantitative analysis of reasoning structure use is not beneficial. Qualitative analysis of the extent to which each gender used certain structures was conducted by first tallying the number of respondents using each reasoning structure by gender. Responses were then separated by domain, gender, and Perry position respectively. These grouped responses were then reread to clarify qualitative differences implied by differences in the tally of usage by gender. This process occurred for both the MER and interview scores. Because the patterns emerging from both processes were nearly identical, the MER and interview data are merged for discussion of reasoning structure usage. Distinct gender related patterns emerged from this analysis indicating different use of reasoning structures in four of the six domains in Position Two and five of the six domains in Position Three.

The Female Pattern. The female pattern for Position Two described the role of the learner as acquiring the answers and assumed that direct provision of answers by authorities was the right way to learn. The role of peers was viewed as one of support. Peers talking in class was advocated to make the atmosphere more relaxed and reduce pressure on individual women to

speak. Talking was often interpreted as asking questions so the entire group could hear the answer without having to ask. Studying together and getting to know each other was also emphasized. This view of learning was reflected in women's description of evaluation as based on knowledge of the material. They noted the need for numerous opportunities to show ones' knowledge since it is not always clear on a particular test or paper. The nature of knowledge as certain was also evident in women's interpretation of discrepancies in knowledge as different opinions about the facts. They suggested resolution of these discrepancies through personal interpretation but acknowledged that in deciding what to believe one could not be sure it was correct.

The nature of knowledge shifted in Position Three. Women's subtle acknowledgement of some knowledge as certain was overshadowed by their focus on the uncertain realms of knowledge. Their suggestion that discrepancies be resolved by personal judgment carried through other domains in the form of less reliance on authority. Position Three women defined their role as learners as collecting others' ideas and practical information. Peers were expected to provide exposure to new ideas and women emphasized hearing others' ideas instead of asking questions. Evaluation accordingly shifted to consider individual differences in learning capacity. Women advocated making personal judgments about students work. Finally the female emphasis on uncertainty emerged in decision making on the basis of what is expected to work out best in the future.

The Male Pattern. The male pattern of reasoning was characterized by an active role for students in learning and a stronger focus on certainty of knowledge. Position Two males stressed that learners should engage in looking for the answers themselves and participate to show the teacher their interest. They also specified that the ways teachers provided for looking

for answers should be interesting. Peers were viewed as partners in argument and quizzing each other, both techniques to find the answers. Evaluation was seen as a process where teachers provide feedback to correct students, but males noted watching teachers to be sure they did not make mistakes. Despite their vulnerability to mistakes, authorities were relied upon to resolve discrepancies in knowledge. The nature of knowledge domain revealed that males in Position Two regarded discrepancies as due to differing degrees of detail, which an appeal to authority could resolve.

The nature of knowledge as certain shifted to the dichotomy of certain and uncertain in Position Three. Males advocated use of research to resolve knowledge questions in the category where knowledge is certain and logic to resolve questions when knowledge is uncertain. Looking for answers as a learner shifted to understanding and being forced to think. The role of peers became one of expressing and debating opinions. Thus while the possibility of uncertainty altered the role of learner and peers, both were still concentrated on getting to the truth. In evaluation of student work males stressed the need for grading to be fair. Finally in decision making males most often relied on the process of choosing options which had the greatest number of positive factors at the present time.

Comparison of the Patterns. Both gender patterns revealed the structural foundation of knowledge as certain in Position Two and knowledge as partially certain and partially uncertain in Position Three. Within Position Two women expressed greater hesitancy to speak in class or criticize authority. This is similar to Belenky et. al.'s description of women as receivers of knowledge. Women's interest in getting to know others and supporting each other matches earlier research suggesting women see themselves as connected to others. The men expressed more interest in active involvement in looking for answers, argument and quizzing each other. This approach and their

willingness to criticize authority reflects the more confident tone of Perry's description of Position Two where the faults of poor authorities are recognized. In Position Three women focused almost exclusively on the uncertainty of knowledge and hearing others ideas with no emphasis on reconciling different ideas. This matches the subjective knowledge category described by Belenky et. al. Men demonstrated a more balanced focus on certainty and uncertainty, and in the latter case relied on Perry's processes of working through uncertainty with logic. Male emphasis on debating of opinions and being forced to think reflect a greater interest in resolving uncertainty.

The two gender patterns lend support to the research conducted with men and women separately cited earlier. However the current data clarify that the patterns exist within the same structural framework, at least in the Position Two and Three portions of Perry's scheme. These data suggest that Belenky et. al.'s received and subjective knowing perspectives could be the female reasoning patterns of Perry's Positions Two and Three. It is important to note that although gender patterns emerged in the current data they were not used exclusively by one gender. Reasoning structures predominantly used by one gender were in most cases also used but to a lesser degree by the opposite gender. It is equally important to note that some reasoning was used equally by both genders. In decision making both genders based decisions on what one likes and what is right (Position Two). Both genders reasoned similarly about the role of instructors in providing information (Position Two) and fostering understanding (Position Three). In the nature of knowledge domain both genders reasoned that two explanations of the same event could mean one was wrong (Position Two) and that opinions could become fact if proven later (Position Three). Thus the gender patterns described here are not gender specific, or used exclusively by one gender, but rather gender related.

Learning Style and Intellectual Development

Comparison of intellectual development and learning styles was explored with both the four styles and the four dimensions from which the styles emerge. Analysis of variance revealed no significant difference in MER scores by learning style, sex, or learning style and sex interaction. Analysis of interview scores revealed the same. Each of the four learning styles were represented in the sample in relatively equal number, and the number of men and women in each style was nearly identical. Thus no relationship emerged between the four learning styles and intellectual development levels.

Correlations between the four learning orientations and MER scores did reveal some small but significant relationships. Concrete experience, defined as relying on feelings in learning, correlated with MER score for males ($r = .30$, $p. < .03$). This suggested that Position Two males would rely less on feelings than would Position Three males since use of feelings in learning would increase with Perry level. This relationship, although certainly not strong from the correlation, follows logically from the notion that increasing uncertainty would warrant increased use of feelings in learning. No significant correlation appeared between concrete experience and MER score for women. Reflective observation, defined as use of watching and listening in learning, correlated with MER scores for women ($r = -.33$, $p. < .01$). This inverse relationship suggested that women rely more on watching and listening when their MER scores are lower, in this case Position Two. This matches the female pattern of received knowledge giving way to more expression in subjective knowledge or Position Three. No correlation appeared with this orientation for males. Active experimentation, defined as a focus on doing or activity in learning, correlated with MER scores for men ($r = -.32$, $p. < .02$). This implied that men would focus more on doing at

Position Two than at Position Three. The male pattern described earlier implied that men were more interested in active learning in both positions, even though they did increase in focus on thinking in Position Three. No correlation of the active experimentation orientation emerged for females. The fourth orientation of abstract conceptualization, defined as thinking as a mode of learning, did not correlate significantly with MER scores for either gender. It is possible that this was effected by the lack of Position Four responses, which would focus on thinking.

Collectively the learning styles data pose a possibility similar to that of the intellectual development data. It is possible that overall learning styles do not differ by gender but reliance on learning dimensions differs in degree by gender. The relationships noted are consistent with qualitative differences in the two gender patterns of reasoning. It is possible that the lack of strength of these relationships is due to the patterns being gender related rather than gender specific. These correlations could also be effected by the existence of only Positions Two and Three in the data. Thus while current results imply that gender differences may exist in learning orientations the results are inconclusive.

Conclusions

Results of the current study support the parallel progression of intellectual development for both men and women. The data clarify the gender related reasoning patterns and support the hypothesis that patterns are not exclusive to either gender. Learning style data are consistent with the gender related patterns, but the relationship of learning styles to intellectual development remains unclear. Caution must be advocated in interpretation of all the data since only a portion of the intellectual development progression is included in this sample. Longitudinal data emerging from continued study of the current students in their remaining

years in college will assist in verification of preliminary conclusions noted here and enable exploration of the progression of intellectual development for each gender pattern.

Implications for Educators

The moral development research suggests that mature moral development requires an integration of the gender patterns in moral reasoning (Gilligan, 1982). The same could be said of intellectual development. Most educators would agree that intellectual functioning that integrates the use of objective and subjective processes is more effective than reliance on only one of those processes. Contextual thinking as defined by the most complex epistemological perspectives in intellectual development theory requires the ability to integrate evidence with contextual circumstances. Kolb's four learning modes are depicted as more highly integrated as development becomes more complex (Kolb, 1984). Thus two parallel tasks emerge for educators. The first is to recognize the different ways of making meaning and learning preferences and create learning environments congruent with these perspectives in order to maximize learning. The second is to foster appreciation for learning modes and ways of making meaning that are incongruent in order to promote increased use of these perspectives to ultimately achieve integration.

Creating learning environments that are congruent with student perspectives first requires looking at their level of intellectual development. The Widick and Simpson (1978) model of developmental instruction proposes that a balance of challenge and support is required for successful functioning and increased complexity. The nature of challenge and support is defined by the students' intellectual development level. Challenge for dualistic students such as those in the current sample comes in the form of encountering diversity in knowledge. Support is needed to avoid

students' explaining diversity encountered as wrong instead of moving to a more complex perspective that allows for uncertainty. Learning environments that are highly structured and give students a process to follow make dealing with uncertainty easier. Personal support and recognition of the difficulty of discovering uncertainty also make accomodating new experiences easier. The intellectual development levels of the students in this study suggest that entering students need a structured environment in which personal support is present. Characteristics of that environment would include a syllabus with specific expectations, how-to guides for assignments, structured processes to follow in class activities, and personal encouragement in class and written feedback. The qualitative gender differences emerging in the present study provide another level of insight from which congruent learning environments can be created. Students in the female pattern would be supported by an environment which values learning by watching and listening, a condition that rarely exists in traditional learning environments. Although lecture requires these learning modes, students who question and respond are perceived as the brightest and often verbal participation is a criteria for grading. Female pattern students would also be supported by an emphasis on summarizing various ideas as opposed to debating various ideas. Male pattern students on the other hand would find support in more active classroom experiences and evaluation of ideas. The learning styles data from this study suggests that a learning environment that allows students to use their preferred learning modes would be beneficial.

It is of course impossible to create an environment which matches all students intellectual levels and learning preferences due to the diversity of students in any given learning environment. Fortunately the intellectual development literature does not advocate learning environments that are

totally congruent with students' development. The literature instead advocates environments that are congruent enough to be supportive of student perspectives and incongruent enough to be challenging of their level of functioning. The second task of fostering appreciation and use of other perspectives and learning modes represents the challenge side of this equation. The diversity that usually appears in learning environments by virtue of students of each gender pattern and various learning styles can be used effectively to challenge students. Focus on the value of listening and watching learning modes challenges those who prefer active modes to learn to use alternatives. Likewise focus on the value of active modes challenges those who prefer less active modes to use and become comfortable with active learning. Opportunities for students to hear and encounter different preferences provides incongruence which must be incorporated into their thinking. Subsequently challenging learning environments would be characterized by activities that place diverse students together to directly encounter different preferences, activities that endorse the value of all learning modes, and feedback regarding the positive use of various learning modes.

In order to accomplish the two tasks outlined here, educators must build learning environments and experiences on the basis of students' levels of development and characteristics rather than on preferred outcomes of development. Most educators have learning preferences of their own which intentionally or unintentionally emerge in the learning environments they create. This creates the potential for those environments to maximize learning for some students and minimize or hinder learning for others. This dilemma can be avoided by using student intellectual development as a foundation to develop learning environments. The descriptions of students' ways of making meaning and learning preferences emerging from studies such as

this one provide a meaningful base from which to create effective learning environments. Research that clarifies the progression of perspectives and learning preferences and their interrelationship will provide the foundation for fostering mature intellectual functioning for diverse populations of students.

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